ACSON Online Tools User Manual

Table Of Content

1.0 What is Psychrometrics 3

2.0 e-Distributors Main Page 4

3.0 Access to Online Psychrometrics 5

4.0 Online Psychrometrics Step by Step 7

4.1 Psychrometrics 9

4.2 Energy 13

4.3 Mixed Air 16

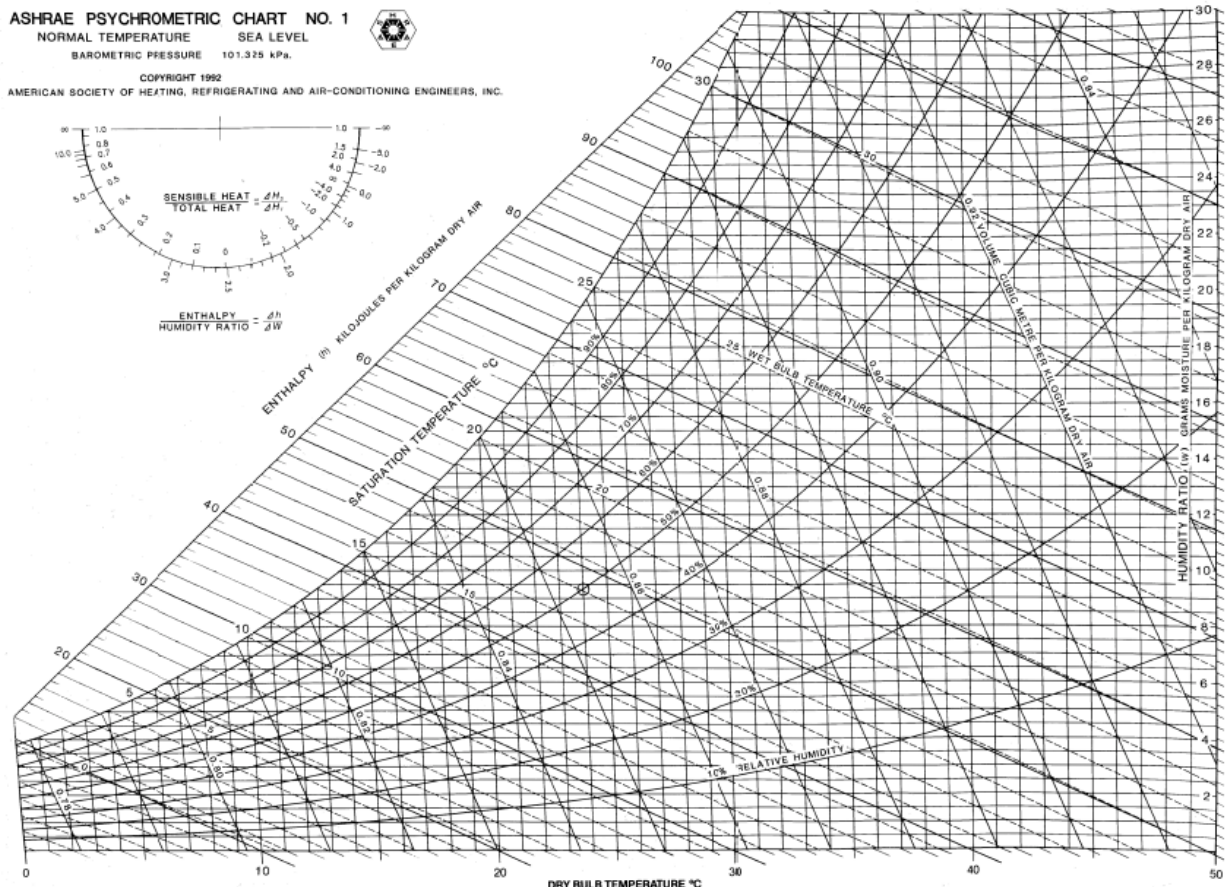
4.4 Off Coil 20

1.0 What is Psychrometrics

Psychrometrics deals with the thermodynamic properties of moist air and uses these properties to analyze conditions and proves involving moist air. The subject is important in air-conditioning practice because atmospheric air is not completely dry but a mixture of air and water vapor.

In the air conditioning, cold/warm air with proper temperature/humidity is fed to a room by air conditioner to keep the room air at the desired temperature/humidity.

Psychrometrics chart consists of the dry bulb temperature, wet bulb temperature, humidity ratio, relative humidity, dew point temperature, specific volume, vapour pressure and enthalpy. If only two values among the above items are known, all other values can be obtained by this chart. Moreover, the variations of air under a certain state when it is heated, cooled, humidified and dehumidified can be judged by plotting the charts, which provides a great convenience for users.


ASHRAE PSYCHROMETRIC CHART NO. 1
NORMAL TEMPERATURE
SEA LEVEL
BAROMETRIC PRESSURE 101.325 kPa.
COPYRIGHT 1992
AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.
SENSIBLE HEAT / TOTAL HEAT
ENTHALPY / HUMIDITY RATIO
ENTHALPY KILOJOULES PER KILOGRAM DRY AIR
SATURATION TEMPERATURE °C
WET BULB TEMPERATURE °C
VOLUME CUBIC METRE PER KILOGRAM DRY AIR
RELATIVE HUMIDITY
HUMIDITY RATIO GRAMS MOISTURE PER KILOGRAM DRY AIR
DRY BULB TEMPERATURE °C

Psychrometric Chart

2.0 e-Distributors Main Page

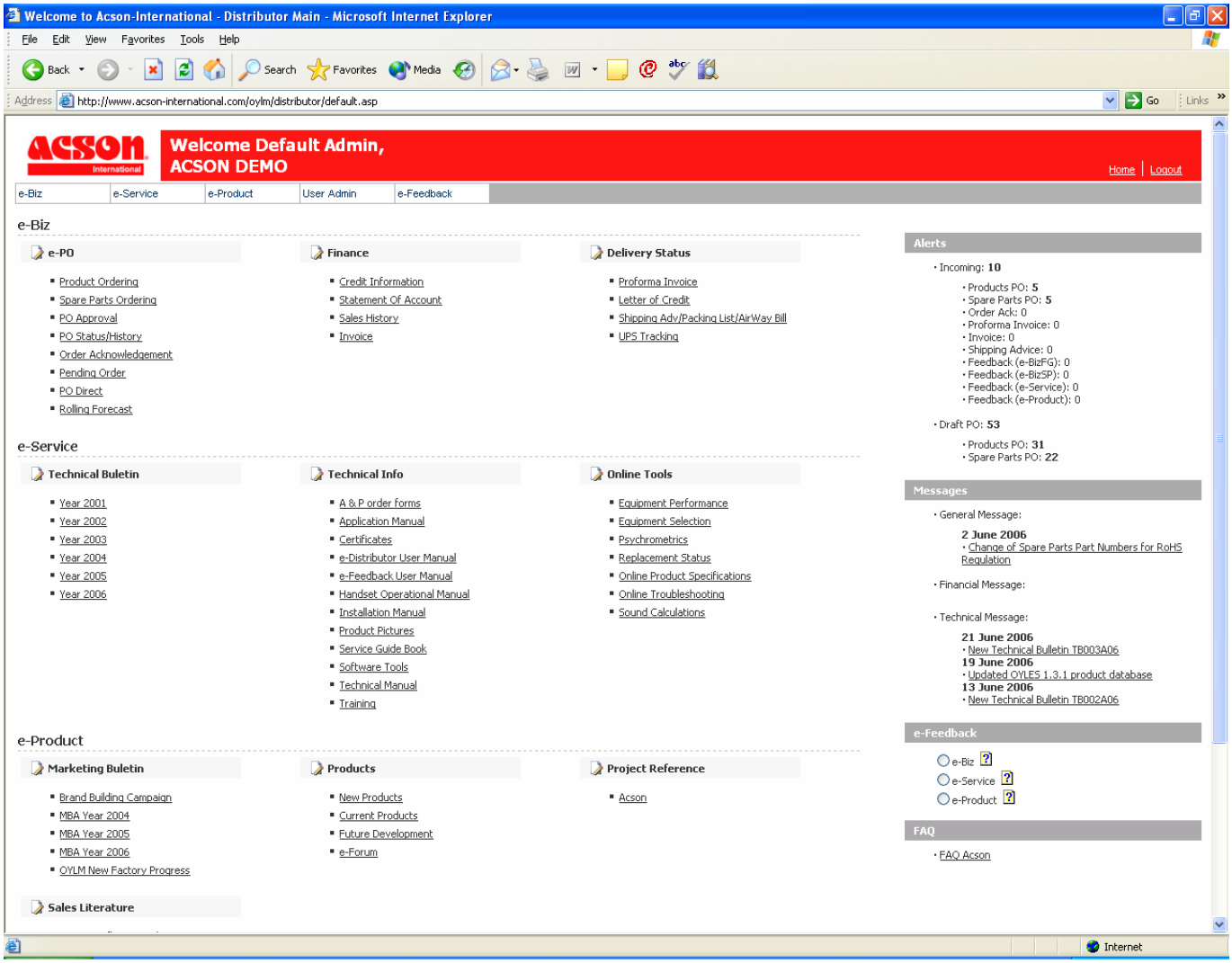


Figure 1

3.0 Access to Online Psychrometrics

There are two ways to access the Online Psychrometrics.

Top Menu

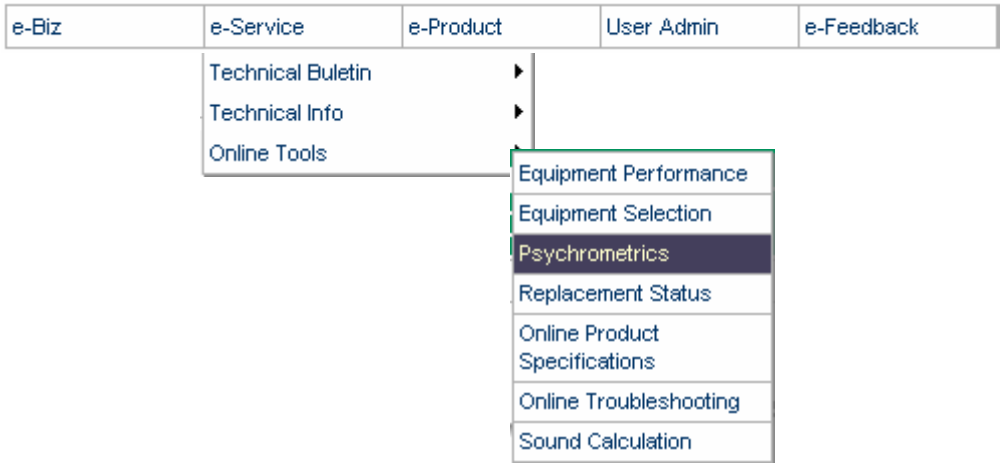


Figure 2

** Click on the sub menu list to be redirected to that sub-section main page.*

1) Menu List: When the mouse pointer moves over the e-Service option, a primary sub-list will be shown.
   : Move the mouse pointer to respective area under primary sub-list to show secondary sub-list (as shown in Figure 2).

Page Content

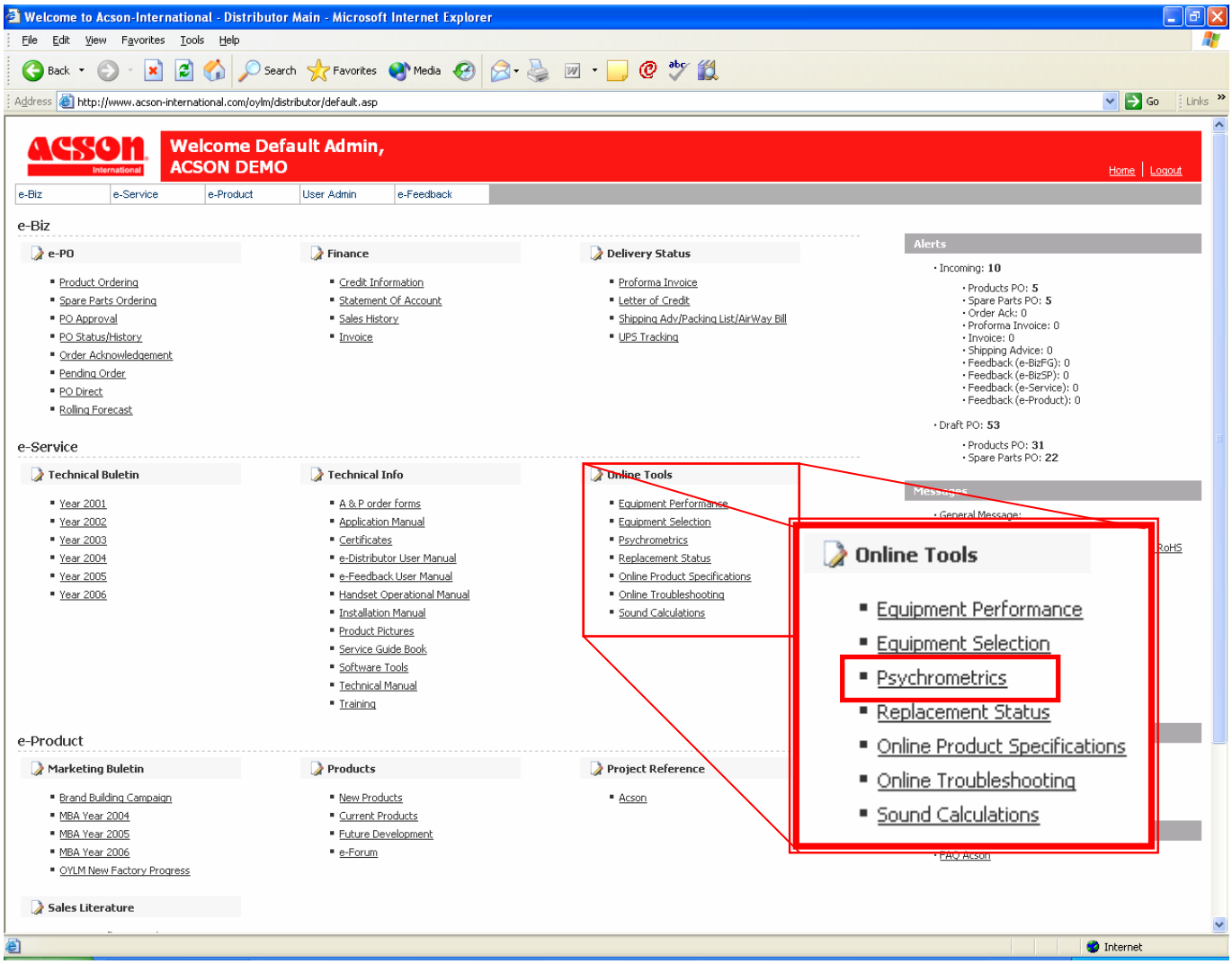


Figure 3

** Under e-Service section, select the Psychrometrics hyperlink under the Online Tools section.*

2) At the e-Distributors main page, move the mouse pointer to the Psychrometrics hyperlink and the mouse pointer will change to over Psychrometrics hyperlink. Click on the hyperlink to select.

4.0 Online Psychrometrics Step by Step

Select Working Unit

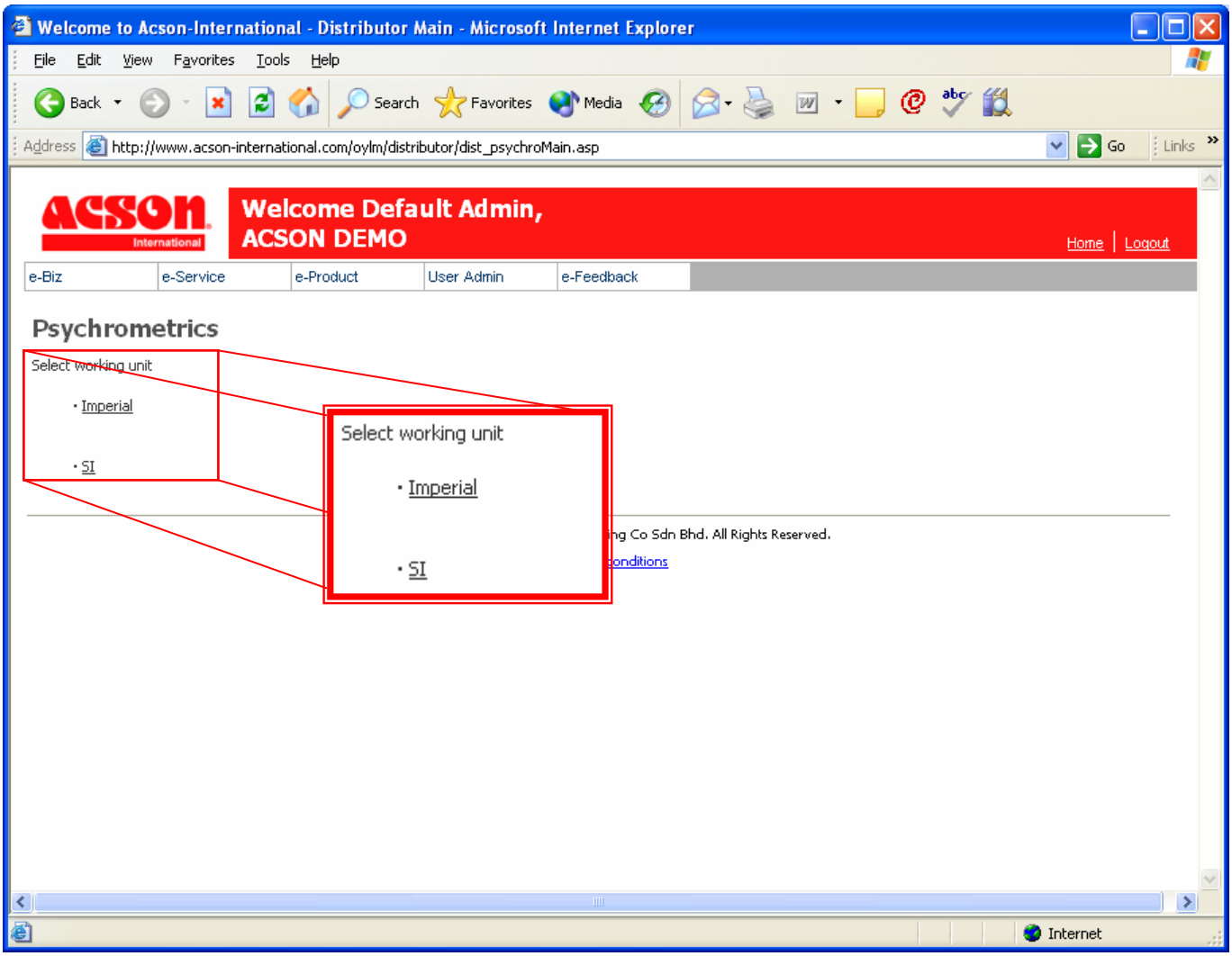


Figure 4

The Online Psychrometrics provides two working units:–

- Imperial unit
- SI unit

Both Imperial and SI contained hyperlink for easy access. Move the mouse pointer to the required working unit and click to select.

Select Calculation Types

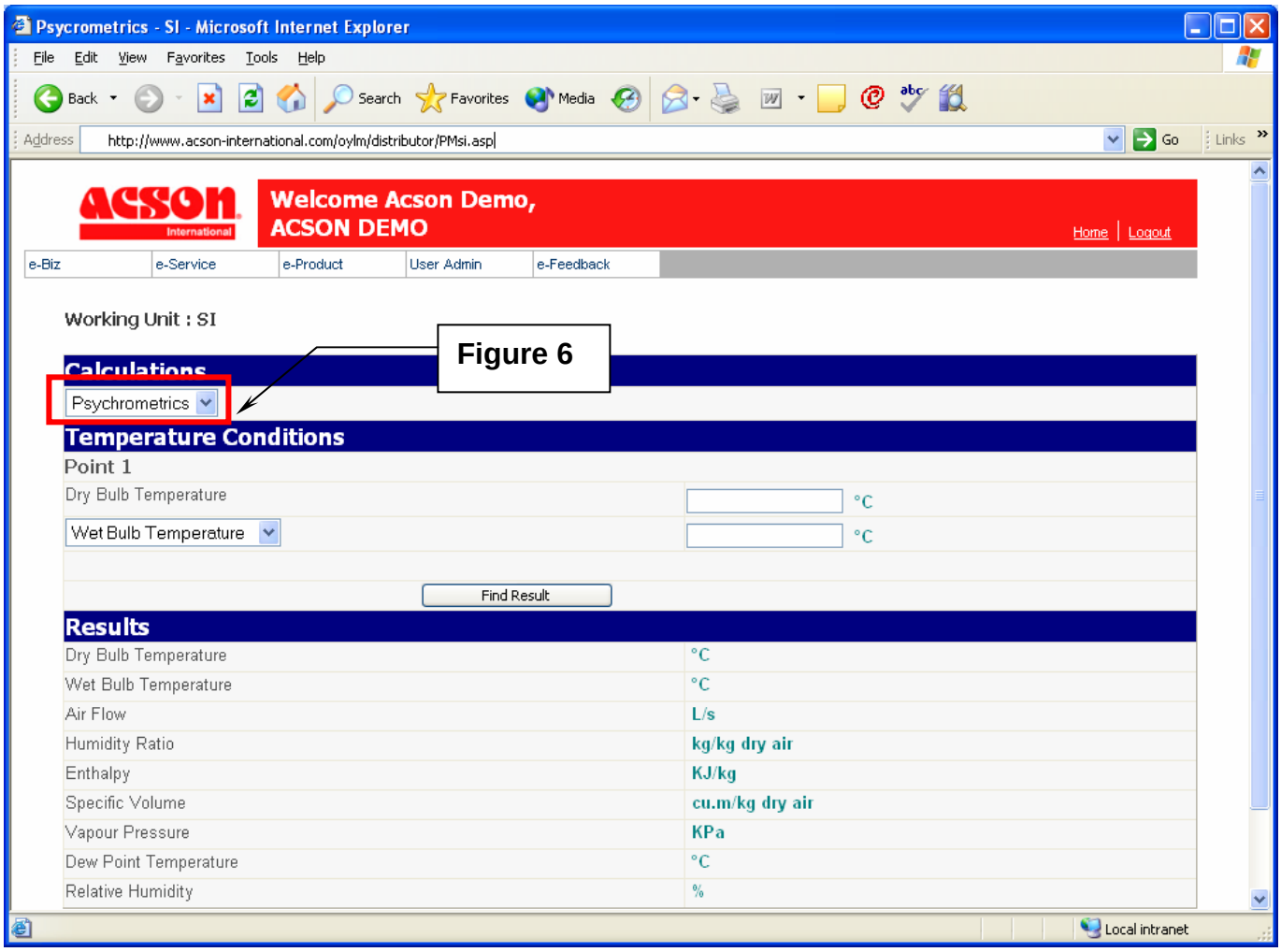


Figure 5

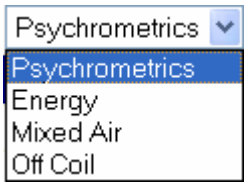


Figure 6

There are 4 types of calculations available, which are:-

- Psychrometrics
- Energy
- Mixed Air
- Off Coil

Select the required calculation type from the combo box (as shown in Figure 6).

4.1 Psychrometrics

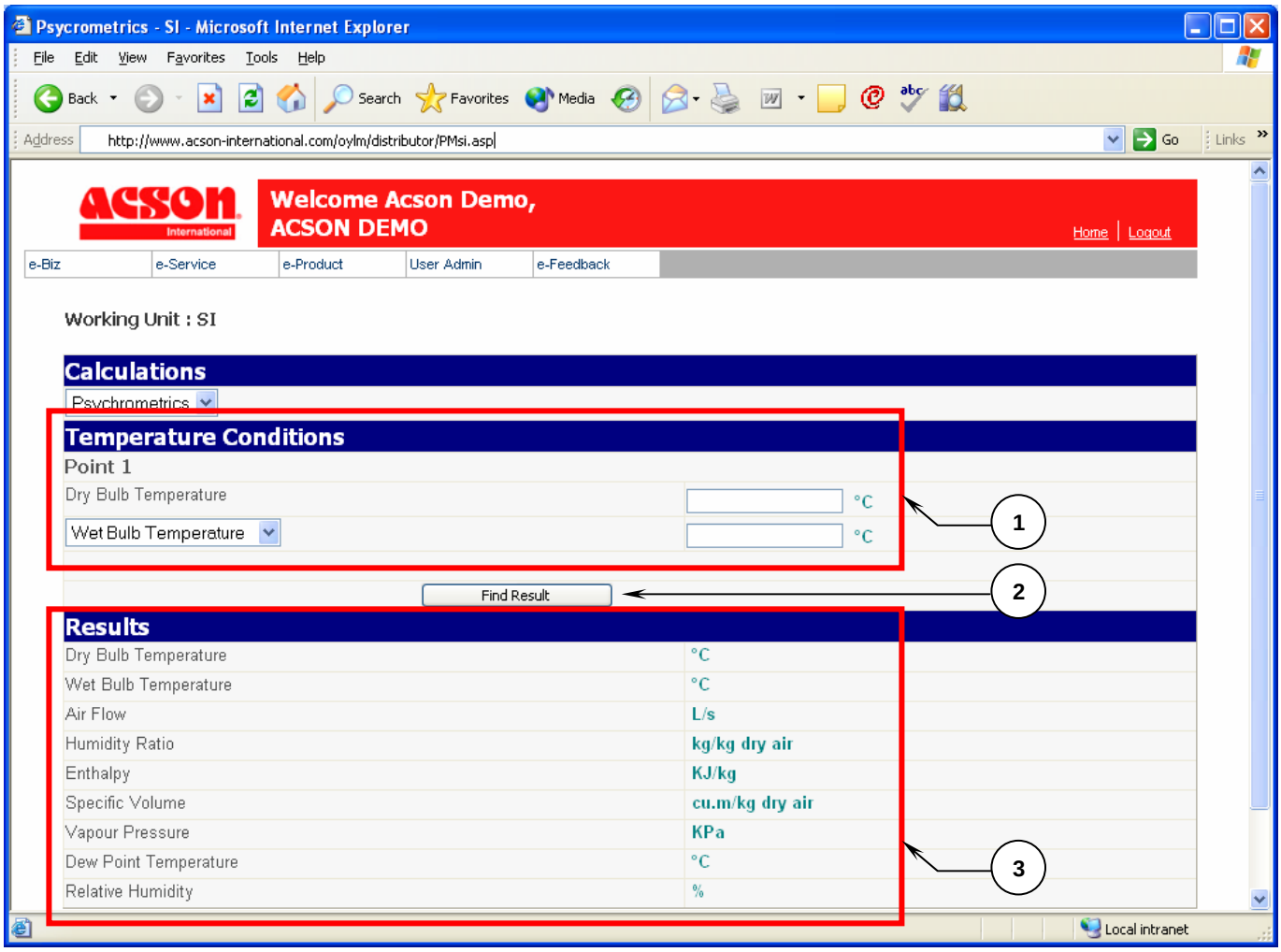


Figure 7

With the Online Psychrometrics, the air properties of air can be obtained by using the dry bulb temperature and wet bulb temperature or dew point temperature or relative humidity.

1) *Input Parameters*

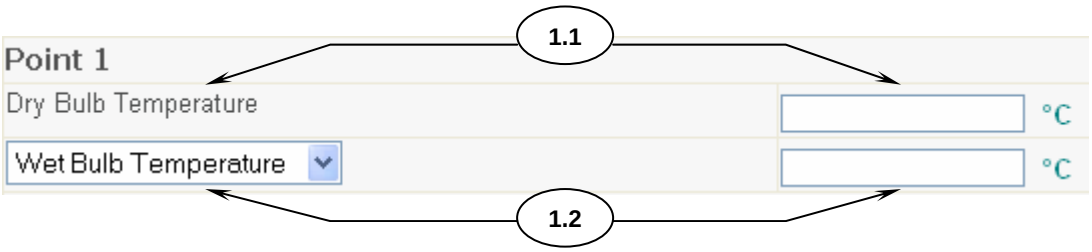


Figure 8

1.1) *Dry Bulb Temperature* : The temperature measured by the ordinary thermometer. [Unit = °C or °F]

1.2) There are 3 types of input parameters available in this combo box (Figure 9):-

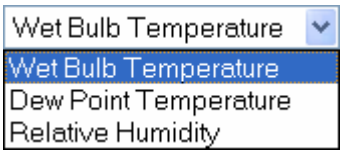


Figure 9

Wet Bulb Temperature : The moist air temperature measured by the wet bulb thermometer. [Unit = °C or °F]

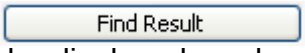
Dew Point Temperature : The temperature of the saturated moist air. [Unit = °C or °F]

Relative Humidity : Ratio of the moist air-specific weight to the saturated air-specific weight. [Unit = %]

User can enter the required input parameters into the textbox on the right hand side as shown in Figure 8.

2) *Find Result*

: Click on the Find Result button to view the results based on the requirement entered in the "*Input Parameters*"

The "Input Parameters" must be entered before selecting the 

button, else the calculations will not proceed and an error message will be displayed as shown in Figure 10.

Figure 10

3) *Results of Air Properties*

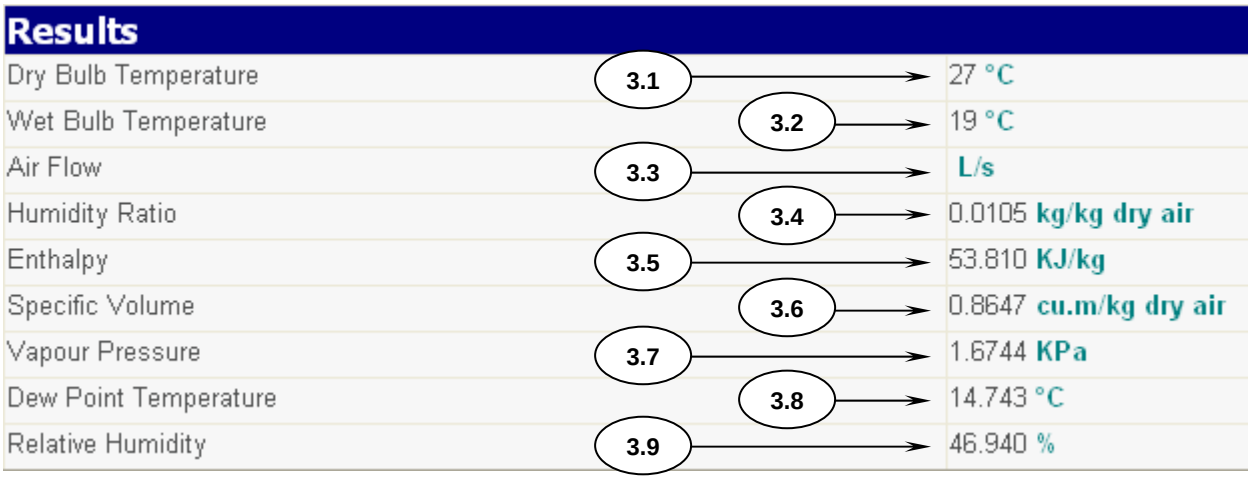


Figure 11

Figure 11 shows an example using 27°C Dry Bulb Temperature and 19°C Wet Bulb Temperature.

3.1) Dry Bulb Temperature : Temperature entered in *section 1.1*.

3.2) Wet Bulb Temperature : - If the selected requirement in *section 1.2* is Wet Bulb Temperature, this will display the value entered in *section 1.2*.
- If the selected requirement in *section 1.2* is Dew Point Temperature or Relative Humidity, this will display the value calculated based on the value input in *section 1.2.*

3.3) Air Flow : Air Flow is not applicable in this Psychrometrics calculation.

3.4) Humidity Ratio : The weight of water vapour to that of dry air contained in moist air. [Unit = kg/kg dry air or lb/lb dry air]

3.5) Enthalpy : A material possesses a certain heat under a certain status, and the heat is called Enthalpy. [Unit = kJ/kg or Btu/lb]

3.6) Specific Volume : The moist air volume per 1 kg of dry air contained in the moist air. [Unit = cu.m/kg dry air or cu.ft/lb dry air]

3.7) Vapour Pressure : Vapour pressure of water in saturated moist air. [Unit = kPa or psia]

3.8) Dew Point Temperature : - If the selected requirement in *section 1.2* is Dew Point Temperature, this will display the value entered in *section 1.2*.
- If the selected requirement in *section 1.2* is Wet Bulb Temperature or Relative Humidity, this will display the value calculated base on the value input in *section 1.2*.

3.9) Relative Humidity : - If the selected requirement in *section 1.2* is Relative Humidity, this will display the value entered in *section 1.2*.
- If the selected requirement in *section 1.2* is Wet Bulb Temperature or Relative Humidity, this will display the value calculated base on the value input in *section 1.2*.

4.2 Energy

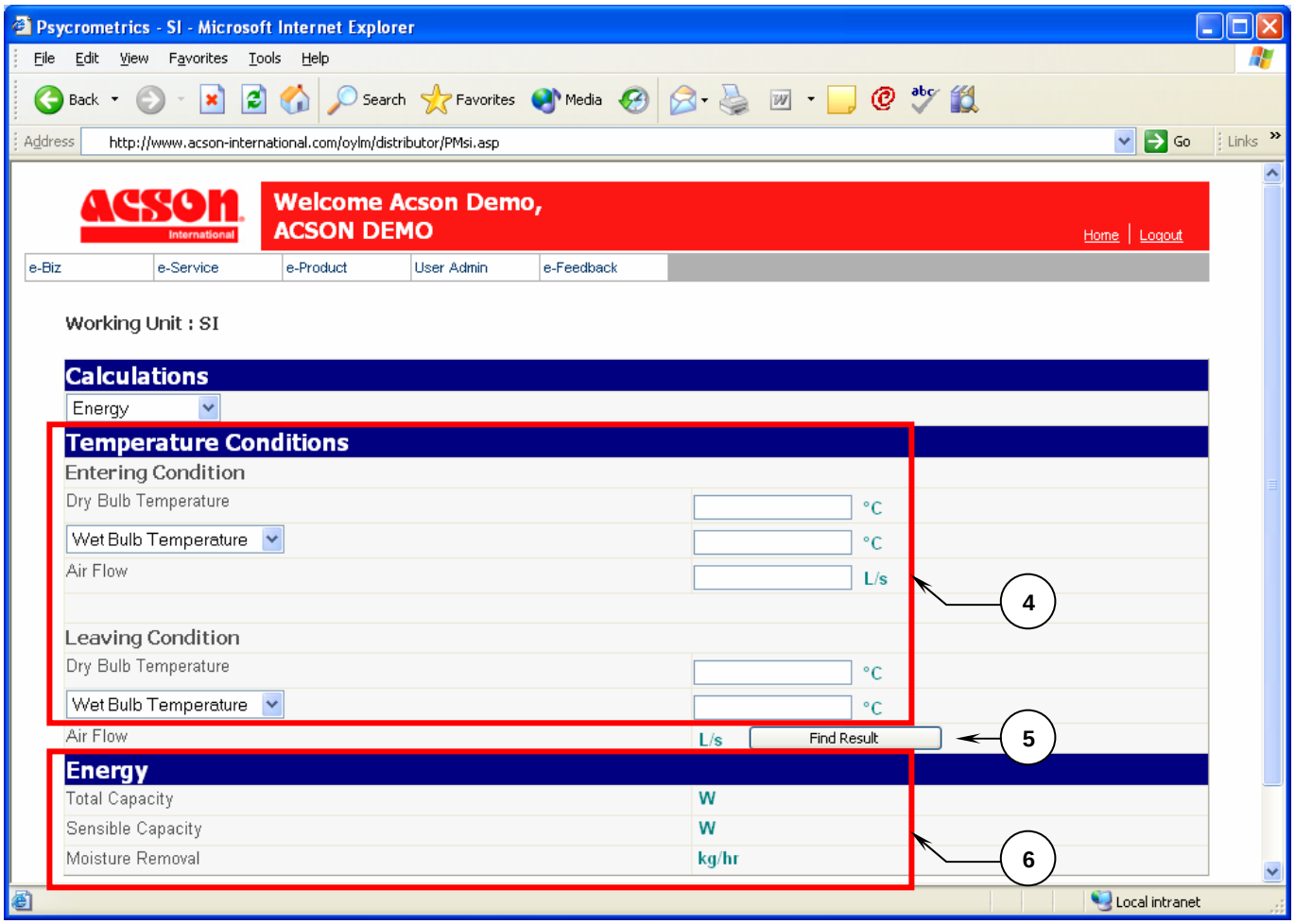


Figure 12

The Energy Calculation allow the user to calculate the total capacity, sensible capacity and moisture removal rate with the air entering and leaving conditions are known.

4) *Input Parameters*

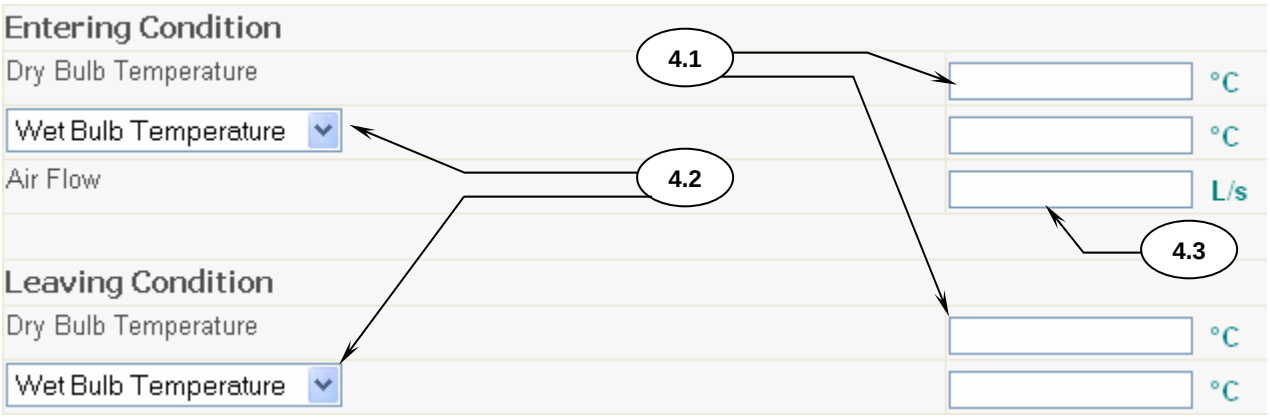


Figure 13

There are 2 conditions for the *Input Parameters* that must be entered:-

- Entering Condition
- Leaving Condition

Both conditions contained the same input parameters

4.1) Dry Bulb Temperature : Please refer to *section 1.1* for details. [Unit = °C or °F]

4.2) There are 3 types of input parameters available in this combo box (Figure 14):-

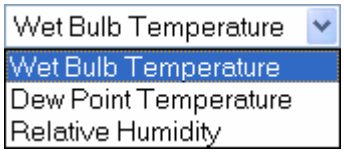


Figure 14

Wet Bulb Temperature : Please refer to *section 1.2* for details. [Unit = °C or °F]
Dew Point Temperature : Please refer to *section 1.2* for details. [Unit = °C or °F]
Relative Humidity : Please refer to section 1.2 for details. [Unit = %]

User can enter the required input parameters into the textbox on the right hand side as shown in Figure 13.

4.3) Air Flow : The air flow rate required. [Unit = L/s or CFM]

5) *Find Result*

Find Result : Click on the Find Result button to view the results based on the requirement entered in the "*Input Parameters*"

The "*Input Parameters*" must be entered before selecting the Find Result button, else the calculations will not proceed and an error message will be displayed as shown in Figure 15.

Data Incomplete !

Figure 15

6) *Results*

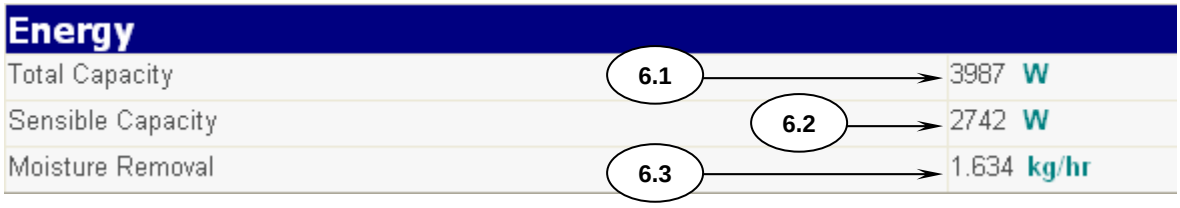


Figure 16

Figure 16 shows an example of Energy calculation results.

6.1) Total Capacity : Total capacity required for the air conditioned area. [Unit = W or Btu/hr]

6.2) Sensible Capacity : Energy required that, added or removed from a substance, results in a measurable change in temperature. [Unit = W or Btu/hr]

6.3) Moisture Removal : The moisture contained in the air removed after passing through the cooling coil. [Unit = kg/hr or lb/hr]

4.3 Mixed Air

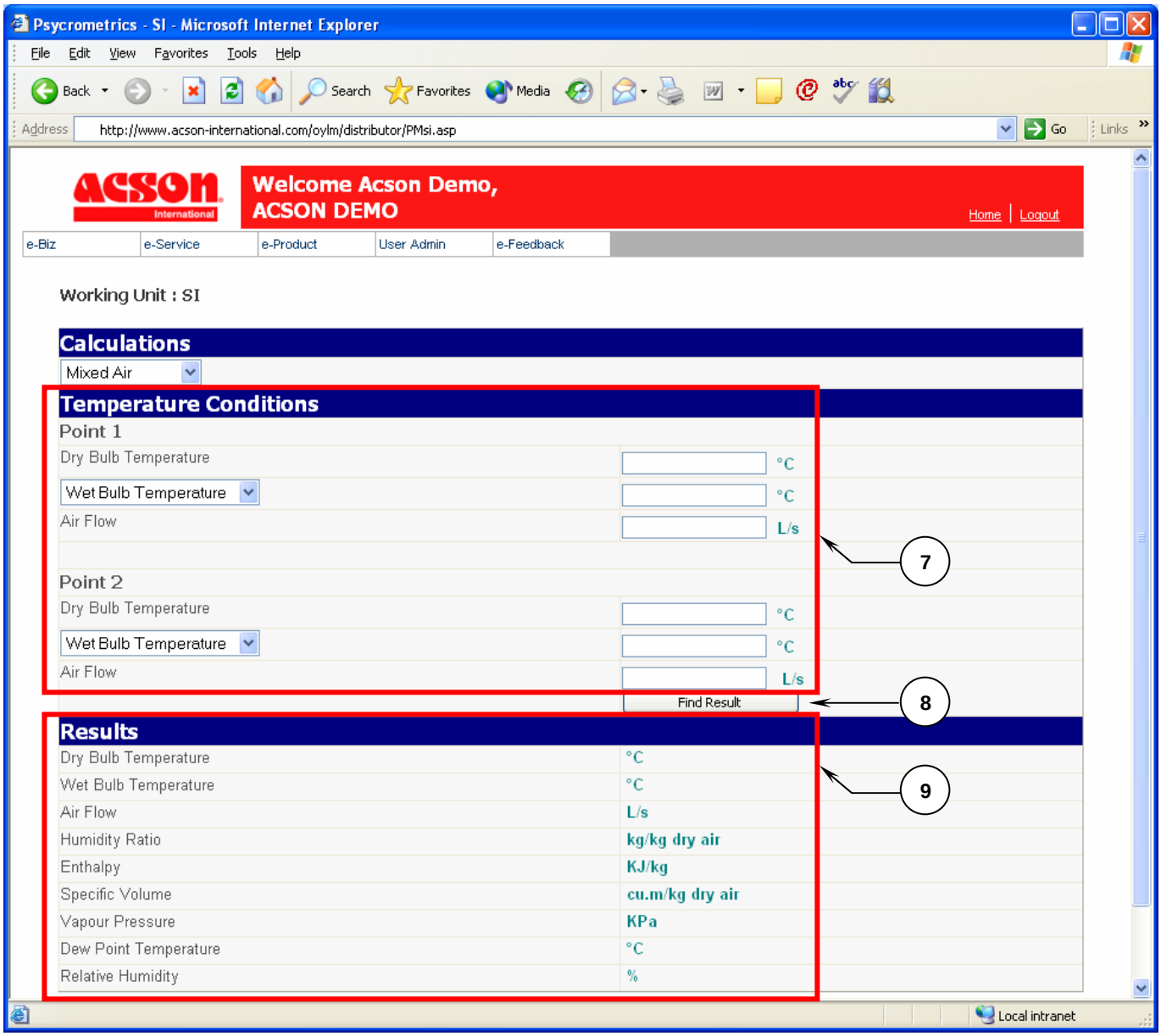


Figure 17

The Mixed Air Calculation allows the user to calculate the mixed air properties of the two moist airstreams.

7) *Input Parameters*

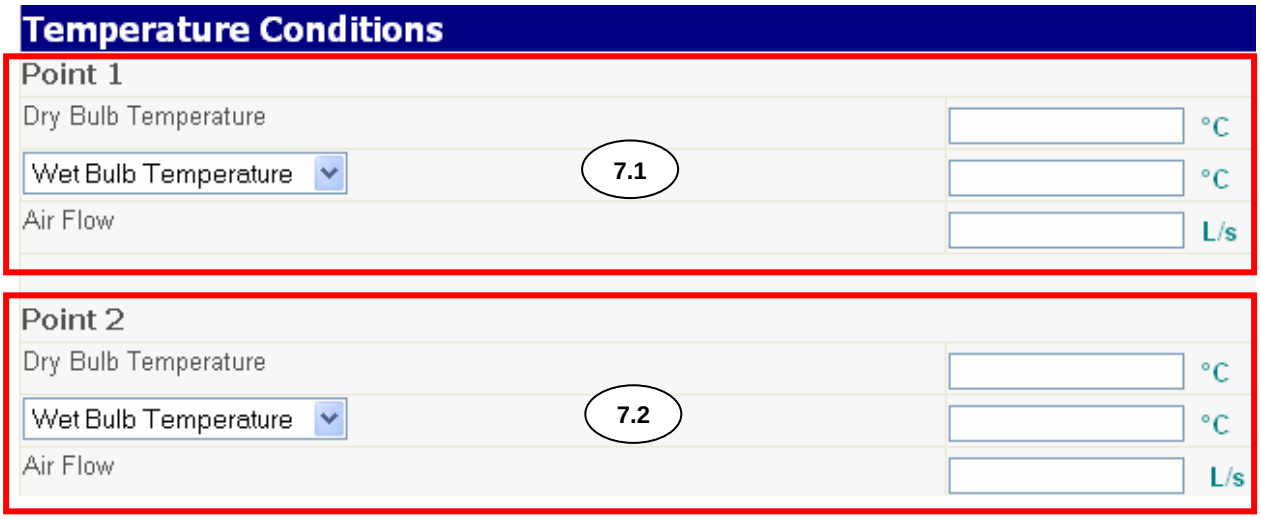


Figure 18

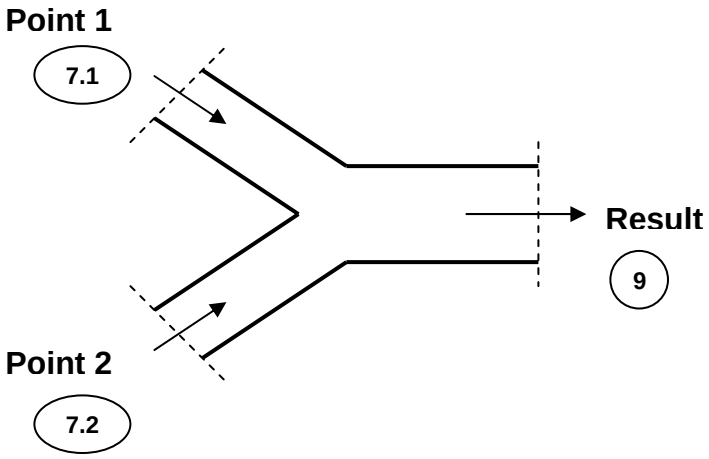


Figure 19

Mixed Air Calculations consists of the mixing of the air of Point 1 and Point 2.

7.1) *Dry Bulb Temperature* : Dry bulb temperature at Point 1. [Unit = °C or °F]
There are 3 types of input parameters available for this combo box (Figure 20):-

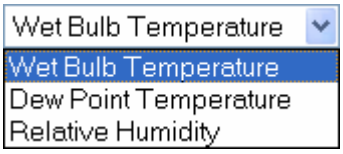


Figure 20

Wet Bulb Temperature : Wet bulb temperature at Point 1. [Unit = °C or °F]
Dew Point Temperature : Dew point temperature at Point 1. [Unit = °C or °F]
Relative Humidity : Relative humidity at Point 1. [Unit = %]

7.2) *Dry Bulb Temperature* : Dry bulb temperature at Point 2. [Unit = °C or °F]
There are 3 types of input parameters available for this combo box (Figure 21):-

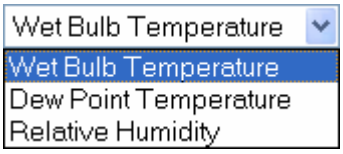
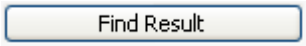


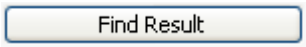
Figure 21

Wet Bulb Temperature : Wet Bulb Temperature at Point 2. [Unit = °C or °F]
Dew Point Temperature : Dew Point Temperature at Point 2. [Unit = °C or °F]
Relative Humidity : Relative Humidity at Point 2. [Unit = %]

8) ***Find Result***



: Click on the Find Result button to view the results based on the requirement entered in the "*Input Parameters*"

The "*Input Parameters*" must be entered before selecting the 

button, else the calculations will not proceed and an error message will be displayed as shown in Figure 22.

Figure 22

9) *Results of Mixed Air Calculations*

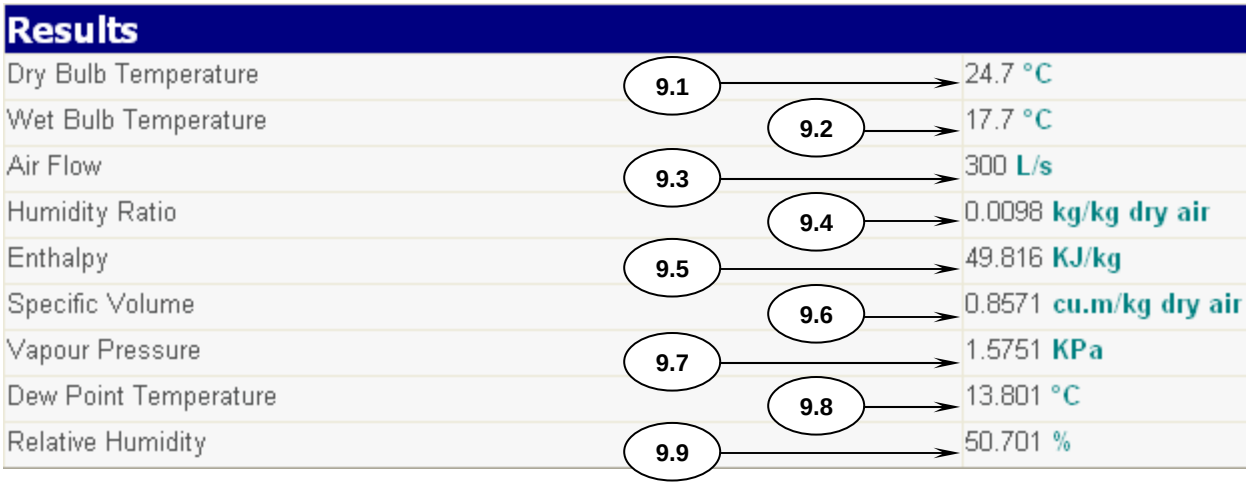


Figure 23

Figure 23 shows an example of the results of mixing the air at Point 1 and Point 2.

9.1) Dry Bulb Temperature : The mixed air dry bulb temperature. [Unit = °C or °F]

9.2) Wet Bulb Temperature : The mixed air wet bulb temperature. [Unit = °C or °F]

9.3) Air Flow : The sum of air flow of Point 1 and Point 2. [Unit = L/s or CFM]

9.4) Humidity Ratio : The mixed air humidity ratio. [Unit = kg/kg dry air or lb/lb dry air]

9.5) Enthalpy : The mixed air enthalpy. [Unit = kJ/kg or Btu/lb]

9.6) Specific Volume : The mixed air specific volume. [Unit = cu.m/kg dry air or cu.ft/lb dry air]

9.7) Vapour Pressure : The mixed air vapour pressure. [Unit = kPa or psia]

9.8) Dew Point Temperature : The mixed air dew point temperature. [Unit = °C or °F]

9.9) Relative Humidity : The mixed air relative humidity. [Unit = %]

4.4 Off Coil Temperature

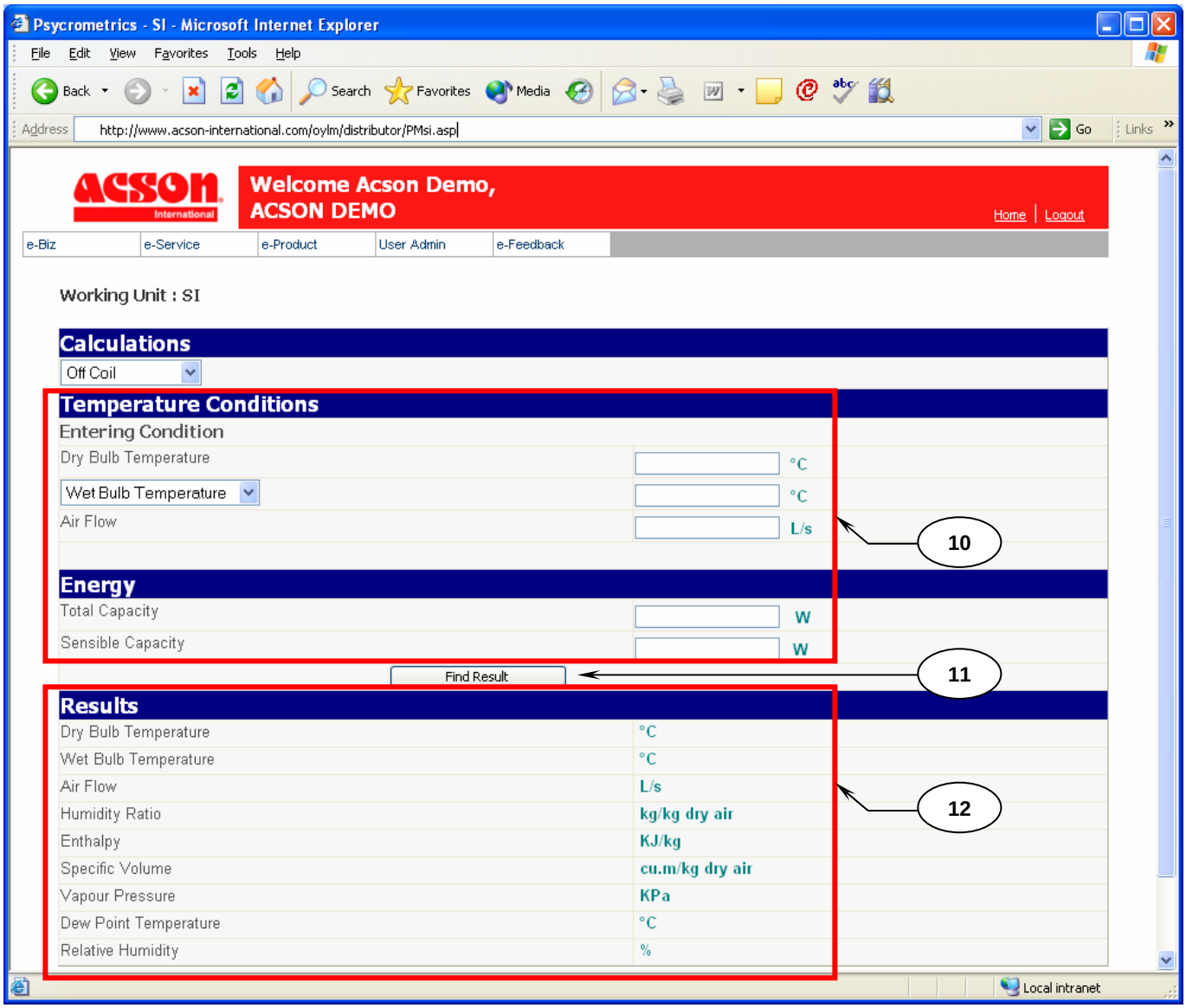


Figure 24

The Off Coil Calculations allows the user to calculate the leaving air properties with the air entering conditions and required energy (total capacity and sensible capacity) are known.

10) ***Input Parameters***

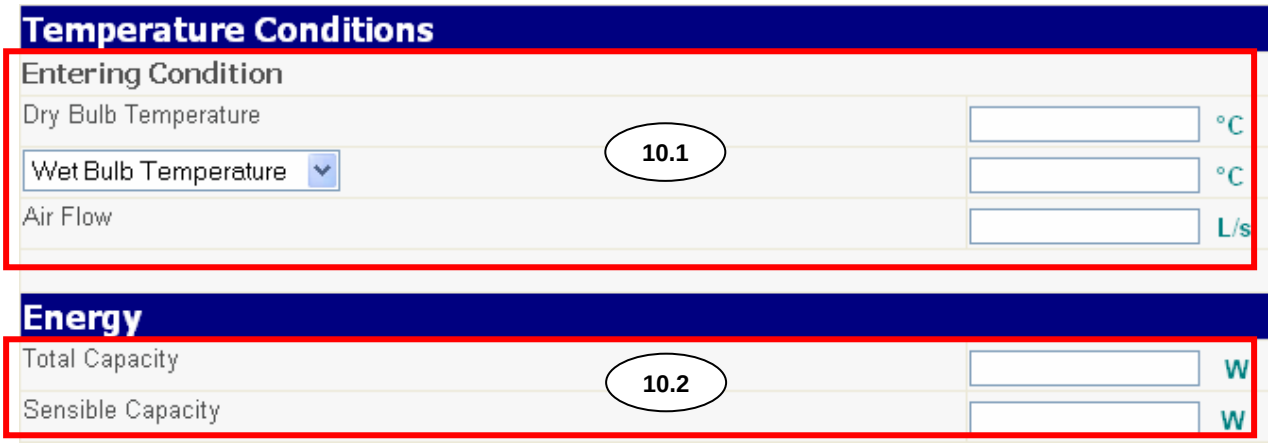


Figure 25

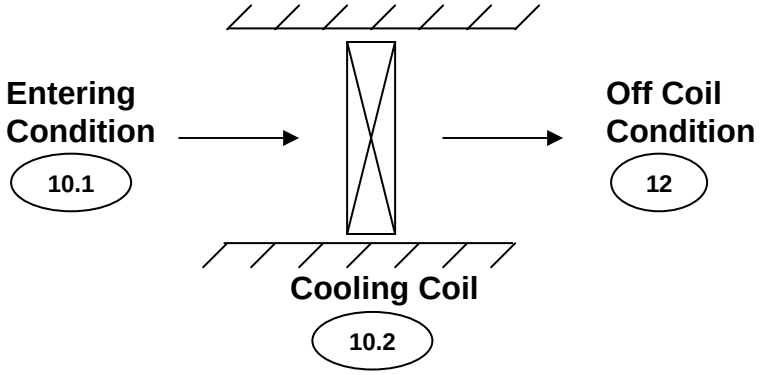


Figure 26

10.1) Dry Bulb Temperature : Dry bulb temperature at Point 1. [Unit = °C or °F]
There are 3 types of input parameters available for this combo box (Figure 27):-

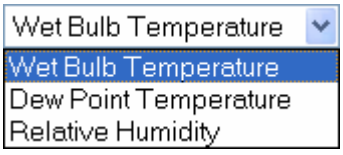


Figure 27

Wet Bulb Temperature : Wet bulb temperature at Point 1. [Unit = °C or °F]
Dew Point Temperature : Dew point temperature at Point 1. [Unit = °C or °F]
Relative Humidity : Relative humidity at Point 1. [Unit = %]

Air Flow : The air flow rate required. [Unit = °C or °F]

10.2) Total Capacity : Total capacity required for the air conditioned area. [Unit = W or Btu/hr]

Sensible Capacity : Energy required that, added or removed from a substance, results in a measurable change in temperature. [Unit = W or Btu/hr]

11) *Find Result*

: Click on the Find Result button to view the results based on the requirement entered in the "*Input Parameters*"

The "*Input Parameters*" must be entered before selecting the

button, else the calculations will not proceed and an error message will be displayed as shown in Figure 28.

Figure 28

12) ***Results of Off Coil Calculations***

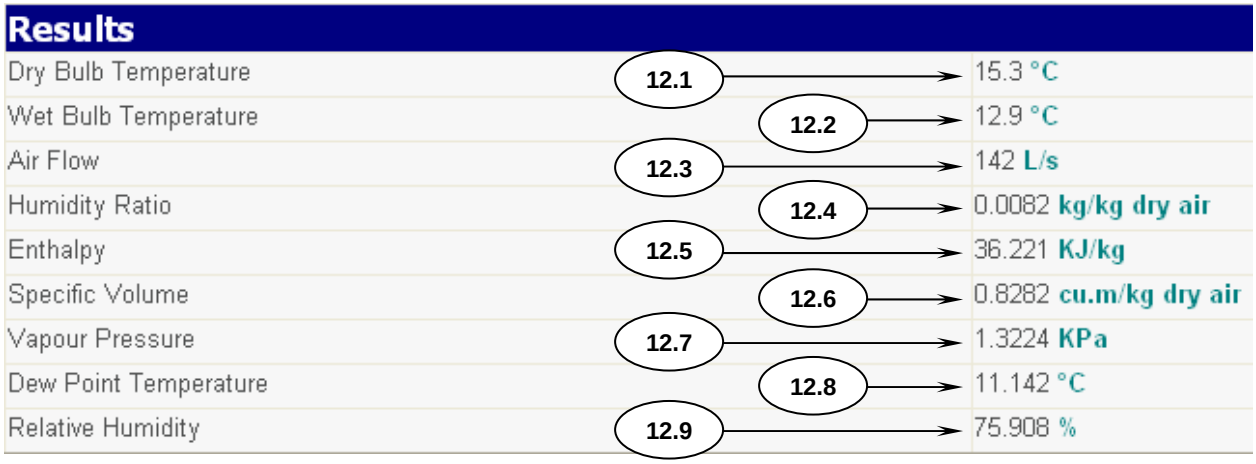


Figure 29

Figure 29 shows an example of the results of Off Coil Calculations.

12.1) Dry Bulb Temperature : The off coil dry bulb temperature. [Unit = °C or °F]

12.2) Wet Bulb Temperature : The off coil wet bulb temperature. [Unit = °C or °F]

12.3) Air Flow : The air flow entered in *section 10.1*. [Unit = L/s or CFM]

12.4) Humidity Ratio : The humidity ratio at off coil condition. [Unit = kg/kg dry air or lb/lb dry air]

12.5) Enthalpy : The enthalpy at off coil condition. [Unit = kJ/kg or Btu/lb]

12.6) Specific Volume : The specific volume at off coil condition. [Unit = cu.m/kg dry air or cu.ft/lb dry air]

12.7) Vapour Pressure : The vapour pressure at off coil condition. [Unit = kPa or psia]

12.8) Dew Point Temperature : The dew point temperature at off coil condition. [Unit = °C or °F]

12.9) Relative Humidity : The relative humidity at off coil condition. [Unit = %]